

# Utility of CECT in Evaluation of Intestinal Obstruction and its Outcome in Terms of Management

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## ABSTRACT

**Background:** Intestinal obstruction is one of the leading causes of admission in general surgical emergency with variable outcomes. It is a mechanical or functional obstruction of the intestines which prevents the normal movement of the products of digestion. Many previous studies have demonstrated computed tomography (CT) to be a valuable technique for imaging intestinal obstruction. Advantages of CT imaging are accurate demonstration of the site, level and cause of obstruction, presence or absence of adverse features such as ischemia, volvulus or closed loop obstruction. CT allows for smaller and site specific incisions with improved wound related outcomes. **Methods:** A prospective observational study on 50 patients admitted in General Surgery department of Rajindra hospital, Patiala with clinical features of intestinal obstruction to show the utility of CECT in diagnosing the presence, level, degree, and cause of intestinal obstruction, and the role of CT in detecting presence of complications. **Results:** The study demonstrated the sensitivity and sensitivity of CT scan in cases of intestinal obstruction as 92% and 100% respectively. The accuracy of CT scan in detecting the cause of intestinal obstruction was found to be 94% (with a significance level of  $P<0.001$ ) with a positive predictive value 100% and negative predictive value 76.92%. **Conclusion:** CT scan is accurate at diagnosing the bowel obstruction with high sensitivity and high specificity; however it is not accurate in determining the cause of the obstruction. In clinical practice it is a useful tool to guide appropriately the line management whether conservative or surgical in such patients.

**Keywords:** Computed tomography, Intestinal obstruction, management.

## INTRODUCTION

Intestinal obstruction is responsible for approximately 20% of surgical admissions of patients with acute abdomen.<sup>[1]</sup> The patients with a bowel obstruction still represent some of the most difficult and vexing problems that surgeons face. The correct diagnosis, optimal timing of therapy and appropriate treatment is critical in preventing complications, particularly perforation and ischemia. The ultimate clinical decisions regarding the management of these patients are dictated by a thorough history and workup and a heightened awareness of potential complications.

Although intestinal obstruction is a common surgical problem; it is essential that this clinical condition is treated properly. The site, level & cause of obstruction is demonstrated accurately & the tentative prognosis be formulated prior to surgery. The diagnosis of intestinal obstruction is based on the comprehensive approach that includes patient

history, physical examination, laboratory tests, and radiological investigations.

The radiography accurately diagnoses intestinal obstruction in approximately 60 percent of cases,<sup>[2]</sup> and its positive predictive value approaches 80 percent in patients with high-grade intestinal obstruction.<sup>[3]</sup> However, plain abdominal films can appear normal in early obstruction and in high jejunal or duodenal obstruction. Therefore, when clinical suspicion for obstruction is high or persists despite negative initial radiography, non-contrast computed tomography (CT) should be ordered.

The conventional CT has been reported to have a sensitivity of 92% and specificity of 93% in detecting complete obstruction was shown in a meta-analysis.<sup>[4]</sup> The intravenous contrast helps in diagnosing the specific cause of intestinal obstruction.<sup>[5]</sup> CECT has shown high diagnostic efficacy in discriminating intestinal obstruction from other causes of acute abdomen.<sup>[6]</sup>

## MATERIALS AND METHODS

A prospective study was done at department of general surgery at Government Medical College, Patiala on 50 patients with symptoms of intestinal obstruction. CECT abdomen was done on these

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patients a) to find the efficacy of this modality in diagnosing the presence, level, degree, and cause of intestinal obstruction, and the role of CT in detecting presence of complications

b) To know the impact of CT in decision making and management (surgical/conservative) of obstruction

c) Also to correlate CT findings with intra operative findings whenever possible.

All patients who reported to the emergency or outpatient department (OPD) with the clinical presentation of intestinal obstruction, or as a diagnosed case of intestinal obstruction (by USG/X-Ray abdomen) and giving consent for CT scan were included in the study. The cases who were severely decompensated state, pregnant, patients with deranged kidney function tests, below 14yrs of age, patients not giving consent for CT scan or patients in whom follow up was not possible were excluded from the study

Computed tomography examinations were done on SOMATOM Emotion 6 (Multislice, Spiral) CT scanner. Imaging and Diagnosis of intestinal obstruction were made as per departmental protocols.

#### **Statistical analysis**

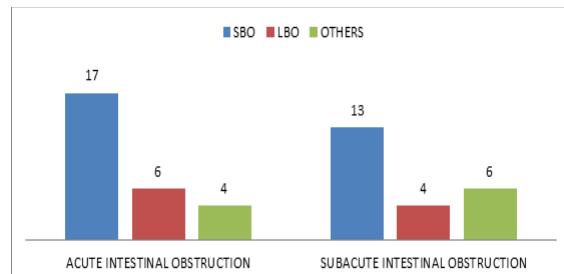
The data collected was entered in the Microsoft excel sheet. SPSS 22.0 software was used to calculate the sensitivity, specificity, positive predictive value, negative predictive value, accuracy and test of significance wherever necessary. The data were evaluated by comparing the CT findings with the final diagnosis in each case.

## RESULTS

The mean age of the patient was 47 years with the range between 17 to 80 years. The most common

age group involved was 51-60 years (26%). The males slightly outnumbered females. There were 28 male and 22 females with male to female ratio 1.2:1. The clinical features of these patients were pain abdomen (100%), abdominal distension (84%), constipation (80%) and vomiting (48%). The others were obstipation(18%) fever (4%), bleeding PR (12%), irreducible swelling in supra umbilical region (2%), RIF mass (2%), Right hypochondrium mass (2%)and abdominal mass (4%).

The 27 cases (54%) had acute intestinal obstruction and 13 (46%) cases had subacute obstruction. Of these 40 cases with intestinal obstruction on final diagnosis majority (30 cases) had small bowel obstruction. Only 10 cases had large bowel obstruction. There were other 10 cases which had presentation similar to intestinal obstruction as shown in [Graph 1]



**Graph 1: Degree and level of intestinal obstruction**

The cause of intestinal obstruction is shown in Table 1. The most common cause of intestinal obstruction in our series was inflammatory (38%), stricture (16%), malignancy (14%), perforation (12%), ventral hernia (6%). Adhesions, intussusception, volvulus, metastasis were 2% respectively each [Table 1]

**Table 1: Cause of Intestinal Obstruction**

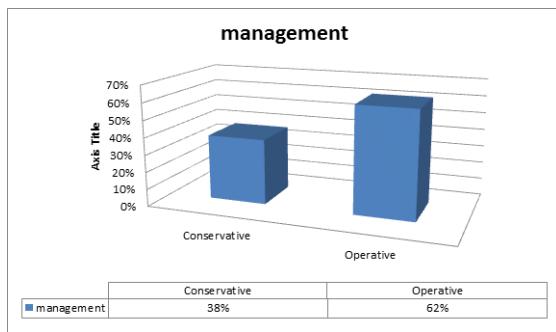
Cause	Sbo (N=30)	Lbo (N=10)	Others (N=10)	Total (N=50)
Malignancy	Gist(2)	Ca Rectum(4) Ca Gall Bladder Infiltrating To Hepatic Flexure(1)		7 (14%)
Stricture	Illeum(8)	0		8(16%)
Adhesions	Distal Sbo(2)	0		2(4%)
Intussusception	Illeoilileal(1)	Illeocolic(1)		2(4%)
Volvus	Mid Gut(1)	Sigmoid (1)		2(4%)
Inflammatory	Abdominal Tb(7)  Paralytic Ileus(3)	Ulcerative Colitis(2)  Crohn's Disease(1)	Pelvic Abscess(2) Liver Disease(2) Pancreatitis(2)	19 (38%)
Perforation	Illeal(2) Duodenal(1)	0	Uterine(3)	6(12%)
Hernia	Ventral Hernia(3)	0		3(6%)
Metastasis			Peritoneal And Liver(1)	1(2%)

**Table 2: CT Findings Vs Final Diagnosis**

CT Findings	Final diagnosis		
	Intestinal obstruction present	Intestinal obstruction absent	Total
Intestinal obstruction present	37	3	40
Intestinal obstruction absent	0	10	10
Total	37	13	50

All the 50 cases included in the study had CT scan. The CT scan diagnosed 40 cases to have intestinal obstruction and 10 cases with no signs of intestinal obstruction on the scan. On the final diagnosis, 37 patients had intestinal obstruction. The three cases were falsely diagnosed to have intestinal obstruction. However, the ten cases were correctly diagnosed to have no intestinal obstruction [Table 2]

After CT scan, 31 (62%) were operated and 19 (38%) were managed conservatively [Figure 2]



**Graph 2:**

When the CT findings were co-related with intra-operative findings, out of 31 patients who were operated, 28 (90%) cases the intra-operative findings co-related with CT findings. In 3 (10%) cases CT findings failed to identify the exact nature of etiology. In 3 cases of pelvic abscess identified on CT, the intra-operative finding was uterine perforation. The CT scan could not detect. The correlation of CT findings with intra-operative findings was found to be highly significant ( $p<0.001$ ).

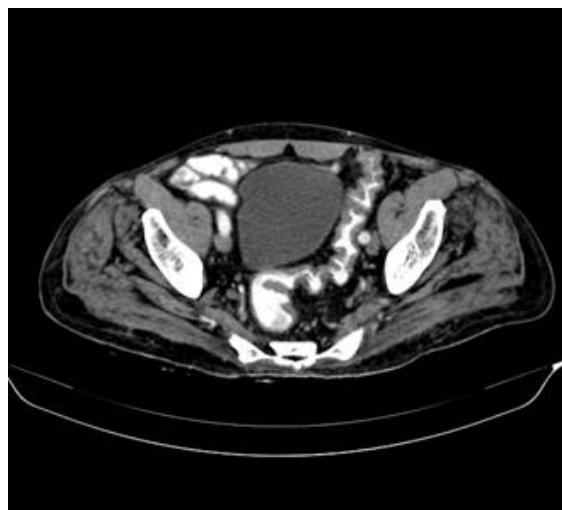
Upon the data analysis for the present study the sensitivity CT was found to be 92.5%, specificity 100%, positive predictive value 100%, negative predictive value 76.92% and accuracy 94% as shown in [Table 3]

**Table 3:**

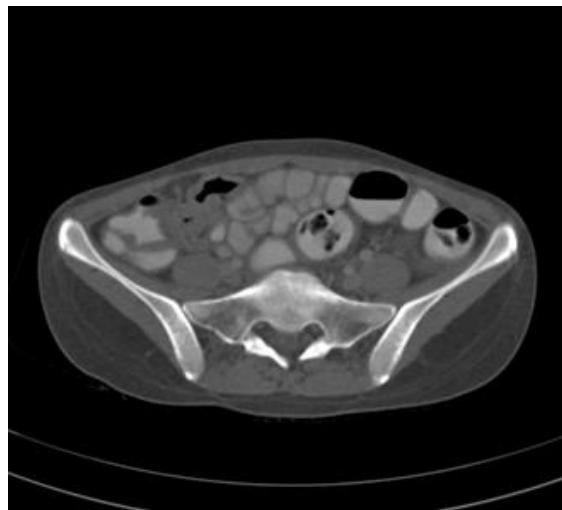
Sensitivity	92.50%
Specificity	100%
PPV	100%
NPV	76.92%
Accuracy	94%



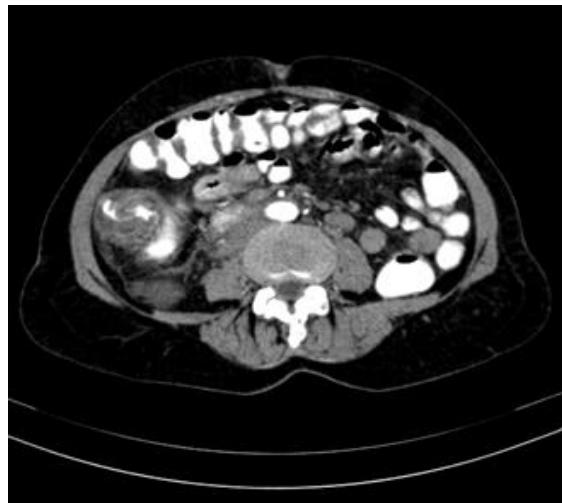
**Figure 1:** Coronal section of ct scan: showing ca gall bladder. Gut loops in left lumbar region are matted.



**Figure 2:** Axial section of ct scan: ca rectum: circumferential heterogeneously enhancing endoluminal growth in ano-rectal region



**Figure 3:** Axial section of ct scan of abdominal tuberculosis showing mesenteric lymphadenopathy and illeo-colic junction thickening



**Figure 4:** Axial ct scan of illeo-colic intussusception: elongated sausage shaped mass giving bowel within bowel configuration in right lumbar region



Figure 5: Axial section of ct scan of jejunoo-jejunal intussusception is seen in left lower quadrant of abdomen with small bowel obstruction.



Figure 8: axial ct scan of ileal stricture present in the proximal ileal segment with dilated gut loops proximal to it, gut loops distal to it appears collapsed.



Figure 6: Axial section of ct scan with pneumoperitoneum suggestive of bowel perforation.

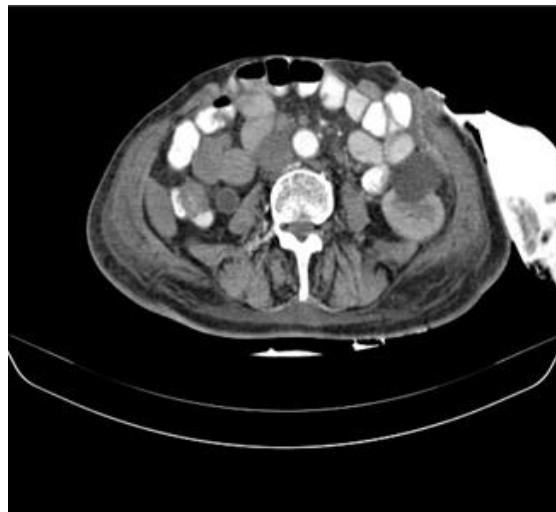


Figure 9: In this figure, the defect in the anterior abdominal wall is seen through which gut loops are seen herniating out.



Figure 7: Axial section of ct scan with small bowel feaces sign suggestive of intestinal obstruction.

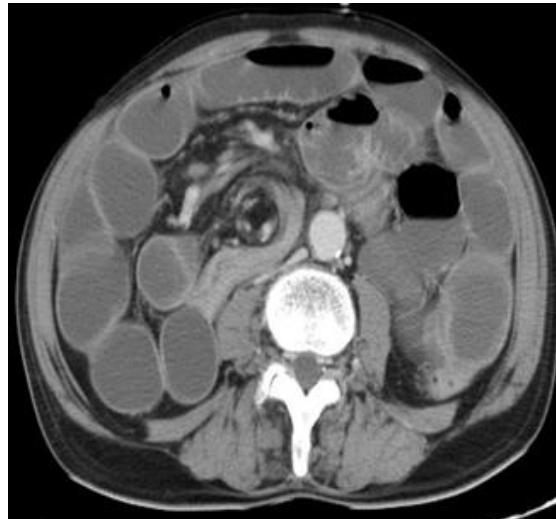


Figure 10: In this figure whirl sign is seen suggestive of small gut volvulus

## DISCUSSION

The utility of CT scan in acute abdomen cases is widely recognized in the past two decades. Most of the studies which have established its role in diagnosing the intestinal obstruction are retrospective in nature. In order to evaluate the role of CT scan in diagnosing the cause, level and degree of the intestinal obstruction which is a guide in planning the management, this prospective study on 50 patients was undertaken. The intra-operative findings were correlated with the CT scan findings whenever possible.

In the present study, the most common age group of patients was between 41 to 60 years with male: female ratio of 1.2:1. Similar findings were also found in the study conducted by Markar et al (2016),<sup>[7]</sup> which had male predominance and male to female ratio was 1.4:1. The common presentation in patients was pain abdomen (100%), abdominal distention (84%), constipation (80%) and vomiting (48%). The others symptoms were obstipation, bleeding PR, fever and abdominal mass. This was similar to the study by Staniland et al (1972) and Chandle et al (1988),<sup>[8,9]</sup> who had reported pain abdomen in 92-100%, vomiting in 82-91% and abdominal distension in 59-70% cases of SBO. Burdet et al (1961),<sup>[10]</sup> reported pain abdomen in 100%, distention in 85% and vomiting in 60% in cases of LBO.

The CT assisted in differentiating the acute condition from the sub-acute condition in cases which upon clinical diagnosis were suspicious of intestinal obstruction. 27 (54%) cases out of 50 had acute intestinal obstruction underwent immediate operative intervention based on CT findings. This approach which lead to prevention of complication which may have occurred due to delay in diagnosis. 23 (46%) out of 50 were diagnosed by CT as sub-acute intestinal obstruction, which later on 4 cases underwent elective surgery (2 cases of ventral hernia, 1 case of GIST and 1 case of Ca rectum) and 19 were managed conservatively. Sixty percent patients had small bowel obstruction as compared to 20% which had large bowel obstruction. The level of obstruction was correctly diagnosed on CT scan. In this regard our study matched other studies findings which had predominantly small bowel obstruction ranging between 67% to 76 % as compared to large bowel was obstruction in 24-32% patients.<sup>[11-12]</sup>

In our study, CT scan benefitted in correctly diagnosing the cases of intestinal Tuberculosis (mural thickening of bowel wall with narrowed lumen, mesenteric lymphadenopathy, omental thickening, pulled up IC junction and ascitis). These 7 cases could be managed on anti tubercular drugs. Three cases of bowel perforation which were not picked on X-ray abdomen were operated in emergency. Two cases of volvulus were correctly identified with characteristic whirl sign which

underwent operative intervention. Four cases of malignancy (2-GIST, 4- Ca rectum, 1- Ca Gall bladder) could appropriately be treated with chemotherapy and surgery in a planned way. One case of liver and peritoneal metastasis could undergo appropriate ileostomy and palliative chemotherapy. Two cases of ulcerative colitis which is very rare condition could be identified on CT scan. To sum up, in 17 out of 50 cases (34%) appropriate management could be done based on CT diagnosis. Taoruel et al,<sup>[14]</sup> (1995) in their study showed that in 21% cases the CT scan made difference in management of small bowel obstruction.

Three cases of uterine perforation were diagnosed preoperatively as cases of gastrointestinal perforation. A Emergency laparotomy was done. The intraoperative findings confirmed these cases to have uterine perforation. This diagnosis of uterine perforation should be borne in mind in cases of postmenopausal cases with acute abdomen and pneumoperitoneum.

CT scan was useful to know the cause behind acute abdomen. In our series, the most common cause was inflammatory (38%) with abdominal tuberculosis (14%) being the predominant among them. This aspect indicates the changing trend in Indian subcontinent. Similar findings have been reported by Suri et al (1993) and Malik et al (2010).<sup>[14,15]</sup> In their studies 3-20% cases of small bowel obstruction were due to abdominal tuberculosis with most common site being terminal ileum.

Various studies have constantly demonstrated high sensitivities (90-96%) and specificities (96-100%) of CT determining the presence of obstruction.<sup>[16-17]</sup> Contrast studies have shown to have a sensitivity of 100 %,<sup>[18]</sup> however they are time consuming and the contrast has to be ingested by the obstructed patient.<sup>[19,20]</sup> Megibow et all (1991),<sup>[21]</sup> showed that CT had sensitivity of 94% and specificity of 96%. Suri et al (1999),<sup>[22]</sup> showed that CT had sensitivity of 93% and specificity of 100%. A systematic review identified CT as having a sensitivity of 92% (range, 81–100%), specificity of 93% (range, 68–100%), PPV of 91% (range, 84–100%), and NPV of 93% (range, 76–100%) in the detection of complete bowel obstruction.<sup>[23]</sup> The present study, CT showed sensitivity of 92.5% and specificity of 100% in diagnosing intestinal obstruction. The cause of obstruction was correctly detected by CT in 37/40. The cases where CT could not pick up the cause included uterine perforation. Hence, CT was found to be highly significant ( $p<0.001$ ) in detection of cause in intestinal obstruction.

In the present study, the accuracy of CT in detecting the cause of intestinal obstruction was 94%, positive predictive value was 100% and negative predictive value was 76.92%. According to Shakil et al (2011),<sup>[24]</sup> accuracy of CT scan in determining the presence of obstruction was 93%. CT scanning had a positive predictive value (PPV) of 89% and a

negative predictive probability (NPV) of 96% for diagnosing bowel obstruction.

## CONCLUSION

In early days, the acute abdomen cases were surgically treated relatively early owing to the difficulty of confidently excluding- on clinical and imaging grounds of complicated intestinal obstruction, which is associated with high mortality rates. Today, an individualized treatment approach to each patient is of paramount importance. The utility of CT scan in such cases is increasingly recognized as it is readily available, less time consuming. It allows confident diagnosis or exclusion of intestinal obstruction. Early surgery is now performed more and more selectively. Many patients are now conservatively managed and elective surgery is planned whenever necessary.

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